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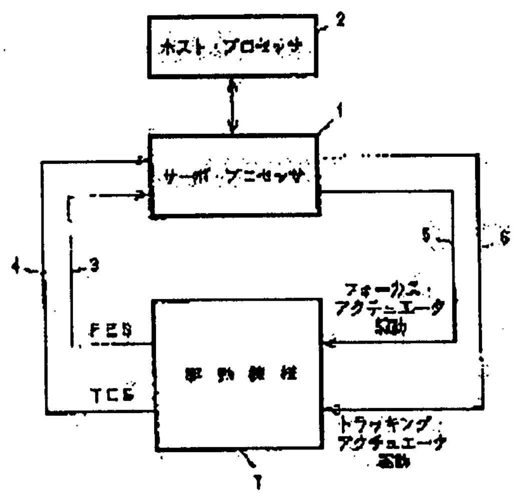
(54) OPTICAL DISK DRIVE AND SIGNAL CORRECTING METHOD FOR THE SAME

(57)Abstract:

PURPOSE: To repeatedly correct a tracking error signal (TES) and a focus error signal(FES) when ordinarily operating the drive of an optical disk by forming the drive so as to detect the errors of the focus error signal and the tracking error signal through three times of track jump at least.



CONSTITUTION: A servo processor 1 inputs an FES 3 and a TES 4, corrects the offset and amplitude error of the FES and further performs processing such as phase compensation and afterwards, a focus actuator drive signal 5 and a tracking actuator drive signal 6 are outputted. While utilizing the track jump to be once performed by the optical disk drive for each rotation at the track followup time, the errors (offset and amplitude error) of FES and TES are detected through three times of track jump at least. Therefore, although the execution of correction is limited only at the time of disk load, the TES and FES can be repeatedly corrected at the time of ordinary operation such as data read/write.

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CLAIMS

[Claim(s)]
[Claim 1] A tracking actuator and a tracking error signal generation means, A tracking servo means to amend offset and amplitude error of a tracking error signal, and to generate the driving signal of the above-mentioned tracking actuator based on the tracking error signal after amendment, The means which emits a track jump command to the above-mentioned tracking servo means since a given truck is followed, A means to detect the maximum and the minimum value of the tracking error signal generated by the track jump at the time of the above-mentioned truck flattery, The optical disk drive which includes a means to calculate offset of a tracking error signal, and the new value of an amplitude error, based on the maximum and the minimum value by which detection was carried out [above-mentioned].

[Claim 2] The optical disk drive according to claim 1 characterized by to pass offset of the focal error signal for which possessed further the focal actuator, the focal error signal generation means, and a focus servo means amended offset of a focal error signal and generated the driving signal of the above-mentioned focal actuator based on the focal error signal after amendment, and it asked before about the above-mentioned given truck at the time of the track jump at the time of the above-mentioned truck flattery to the above-mentioned focus servo means.
[Claim 3] The optical disk drive according to claim 1 which includes further a storage means to memorize the output of the above-mentioned count means for the memory location which becomes settled in the address of the above-mentioned given truck.
[Claim 4] The above-mentioned count means the offset value of the tracking error signal before calculated about the above-mentioned given truck by combining with the maximum of the above-mentioned tracking error signal, and the sum of the minimum value The amplitude error of the tracking error signal which calculated the new value of the above-mentioned offset, and was before searched for about the above-mentioned given truck by combining with the maximum of the above-mentioned tracking error signal, and the difference of the minimum value The optical disk drive according to claim 1 characterized by calculating the new value of the above-mentioned amplitude error.
[Claim 5] The above-mentioned tracking error signal maximum and minimum value detection means are the optical disk drive containing the low pass filter which passes a tracking error signal according to claim 1.
[Claim 6] The proofreading approach of the tracking error signal the optical disk drive characterized by calculating the offset value of a tracking error signal based on the maximum and the minimum value of a tracking error signal which are generated by the track jump at the time of truck flattery actuation in the optical disk drive which performs tracking servo control by having a tracking actuator and generating the driving signal of this tracking actuator based on a tracking error signal.
[Claim 7] The proofreading approach of the tracking error signal the optical disk drive characterized by calculating the amplitude error of a tracking error signal based on the maximum and the minimum value of a tracking error signal which are generated by the track jump at the time of truck flattery actuation in the optical disk drive which performs a tracking servo by having a tracking actuator and generating the

driving signal of this tracking actuator based on a tracking error signal.

[Claim 8] A tracking actuator and a tracking error signal generation means, A tracking servo means to generate the driving signal of the above-mentioned tracking actuator based on a tracking error signal, A focal actuator and a focal error signal generation means, A focus servo means to amend offset of a focal error signal and to generate the driving signal of the above-mentioned focal actuator based on the focal error signal after amendment, In at least 1 time of the track jump at the time of the means which emits a track jump command to the above-mentioned tracking servo means since a given truck is followed, and the above-mentioned given truck flattery In at least 1 time of the track jump at the time of a means to pass the value which applied the forward value to the offset value of the focal error signal for which it asked before to the above-mentioned focus servo means, and the above-mentioned given truck flattery The means passed to the above-mentioned focus servo means by making into an offset value the value which applied the negative value to the offset value of the focal error signal for which it asked before the above, A means to detect the amplitude of the tracking error signal generated by the track jump performed by correcting the focal error signal offset value at the time of the above-mentioned truck flattery, The optical disk drive including a means to calculate the new value of offset of a focal error signal based on the amplitude by which detection was carried out [above-mentioned].

[Claim 9] The optical disk drive according to claim 8 which includes further a storage means to memorize the output of the above-mentioned count means for the memory location which becomes settled in the address of the above-mentioned given truck.

[Claim 10] The above-mentioned count means is an optical disk drive according to claim 8 characterized by calculating the new value of the above-mentioned offset by combining with the offset value presumed from the amplitude of the tracking error signal generated by the track jump which corrected the above-mentioned focal error signal offset value, and performed the offset value of the focal error signal for which it asked before about the above-mentioned given truck.

[Claim 11] The above-mentioned tracking error signal amplitude detection means is the optical disk drive containing the low pass filter which passes a tracking error signal according to claim 8.

[Claim 12] It has a tracking actuator and a focal actuator. By generating a tracking actuator driving signal based on a tracking error signal, and generating a focal actuator driving signal based on a focal error signal In the optical disk drive which performs tracking servo control and focal servo control In at least 1 time of the track jump at the time of given truck flattery By adding forward offset, correct the original desired value of a focal error signal, perform focal servo control, and it sets to at least 1 time of the track jump at the time of the above-mentioned given truck flattery. By adding negative offset, correct the original desired value of the above-mentioned focal error signal, and focal servo control is performed. The focal error signal proofreading approach of the optical disk drive characterized by calculating the offset value of a focal error signal based on the amplitude of these tracking error signal generated by 2 times of track jumps even if few.

[Claim 13] the above -- the focal error signal proofreading approach according to claim 11 that 2 times of track jumps are continuously performed even if few.

[Claim 14] A tracking actuator and a tracking error signal generation means, A tracking servo means to amend offset and amplitude error of a tracking error signal, and to generate the driving signal of the above-mentioned tracking actuator based on the tracking error signal after amendment, A focal actuator and a focal error signal generation means, A focus servo means to amend offset of a focal error signal and to generate the driving signal of the above-mentioned focal actuator based on the focal error signal after amendment, In at least 1 time of the track jump at the time of the means which emits a track jump command to the above-mentioned tracking servo means since a given truck is followed, and the above-mentioned given truck flattery In at least 1 time of the track jump at the time of a means to pass the value which applied the forward value to the offset value of the focal error signal for which it asked before to the above-mentioned focus servo means, and the above-mentioned given truck flattery In at least 1 time of the track jump at the time of a means to pass the value which applied the negative value to the offset value of the focal error signal for which it asked before the above to the above-mentioned focus servo means, and the above-mentioned given truck flattery The means passed to the above-

mentioned focus servo means, without correcting the offset value of the focal error signal for which it asked before the above, A means to calculate the new value of offset of a focal error signal based on the amplitude of the tracking error signal generated by the track jump performed by correcting the focal error signal offset value at the time of the above-mentioned truck flattery, Include a means to calculate offset of a tracking error signal, and the new value of an amplitude error based on the maximum and the minimum value of a tracking error signal which are generated by the track jump performed without correcting the focal error signal offset value at the time of the above-mentioned truck flattery. Optical disk drive.

[Claim 15] The optical disk drive according to claim 14 which includes further a storage means to memorize the output of the above-mentioned count means for the memory location which becomes settled in the address of the above-mentioned given truck.

[Claim 16] It has a tracking actuator and a focal actuator. By generating a tracking actuator driving signal based on a tracking error signal, and generating a focal actuator driving signal based on a focal error signal In the optical disk drive which performs tracking servo control and focal servo control In at least 1 time in 3 times or more of the track jumps followed at the time of given truck flattery By adding forward offset, correct the original desired value of a focal error signal, perform focal servo control, and it sets to at least 1 time of the track jump of the 3 above-mentioned times or more of the track jumps. By adding negative offset, correct the original desired value of the above-mentioned focal error signal, perform focal servo control, and it sets to at least 1 time of the remaining track jumps of the 3 above-mentioned times or more of track jumps. Focal servo control is performed according to the original desired value of the above-mentioned focal error signal. A focal error signal offset value is calculated based on the amplitude of the tracking error signal generated by at least 2 times of the track jumps which added forward or negative offset and carried it out to the original desired value of the above-mentioned focal error signal. By at least 1 time of the track jump performed without correcting the original desired value of the above-mentioned focal error signal The proofreading approach of the focal error signal of the optical disk drive characterized by calculating offset of a tracking error signal, and the value of an amplitude error based on the maximum and the minimum value of a tracking error signal to generate, and a tracking error signal.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical disk drive equipped with the calibration function of a focal error signal or a tracking error signal.
[0002]
[Description of the Prior Art] In an optical disk drive, in order to make an optical spot follow the face deflection of a disk, and meandering of a truck, tracking servo control and focal servo control are performed. Generally, according to tracking servo system, the location of an optical spot is controlled by focal servo system, respectively so that a focal error signal becomes zero, so that a tracking error signal becomes zero.
[0003] Now, in an optical disk drive, the disk which records data is exchangeable. Therefore, the optimal parameter of servo system always is not regularity. Moreover, since the property of a disk is not uniform, it is required to carry out self-calibration so that the parameter of servo system may become the optimal.
[0004] Then, also when the property of a disk is not uniform, R/W and whenever it loads a disk so that it can access, proofreading of a tracking error signal or a focal error signal is performed correctly. Since the property may not be uniform in the disk of one sheet at this time, it is common to proofread for some of every locations of a disk. In this case, in order to have been able to write data after loading the disk since proofreading took time amount, there was this several seconds thing and it was user-unfriendly.
[0005] Some approaches of proofreading are proposed. First, 1" 86 mm Magneto-optical Disk Drive", and Nakashima et al and the approach indicated by SPIE Vol.1316 Optical Data Storage pp.16-29 (1990) are explained. Amplitude of the tracking error signal which is off in a tracking servo whenever a disk is newly loaded, and generates only a focus servo by the eccentricity of a disk at the time of ON (TEp-p) det It detects and is a desired value. (TEp-p) typ A ratio is taken and it is a standardization multiplier. Cte = typ (TEp-p)/det (TEp-p) It asks. Next, the signal level of pre-pit which adds offset to a tracking error signal and is reproduced is investigated, and it is an offset value forward [in a certain bottom ****** level of level] and negative than maximum. OFFSET1 OFFSET2 It carries out and is detection offset about the central value. OFFSETte It carries out. It is a tracking error signal after proofreading by these. TEcal TEcal = Cte * Cagc * (TE-OFFSETte) It is calculated. Here Cagc In order that the signal level of pre-pit may be dependent on the reinforcement of laser, it is a multiplier for amending it. To a focal error signal, whenever a disk is loaded, the objective lens upper and lower sides are carried out, the amplitude of S curve is measured, and the following performs the same processing as a tracking error signal.
[0006] However, since according to this approach the amplitude of a tracking error signal is undetectable unless it turns OFF a tracking servo probably, proofreading takes time amount. Though it proofreads while not writing data, when the demand of R/W of data comes during the activity, there is a problem that a response is overdue. Moreover, if the noise by the defect and dispersion of a disk is added in the case of detection of the amplitude, it will serve as a proofreading error as it is, and will

appear. being appropriate -- it is alike and the effective noise rejection approach is not shown in this reference.
[0007] 2) "The drive control technique in 90mm optical disk unit", Yoshimoto et al., the Mitsubishi electrical-and-electric-equipment technical report Vol.66, No.6, and pp.629-633 (1992) have proposed the removal approach of a noise. By this reference, by repeating a track jump repeatedly during disk 1 rotation, and measuring and equalizing the maximum and the minimum value of a tracking error signal, the effect of a noise is removed and the approach of amending offset of a tracking error signal is stated. However, there was a problem that that measurement of the offset value which should be canceled is performed when a disk is loaded, and R/W of data is attained took the time amount for several seconds. Furthermore, there was a problem that fluctuation of offset with the passage of time could not be coped with, like reference 1. Moreover, this reference does not show how to proofread about the amplitude of a tracking error signal, or offset of a focal error signal.
[0008] 3) In JP,4-278233,A, the offset value is calculated based on the maximum and the minimum value of a tracking error signal which are generated at the time of seek operation and a track jump as an approach of canceling the offset included in the tracking error signal of an optical disk drive. As the count approach, the maximum and the minimum value of a tracking error signal are held in a sample hold circuit to the timing of a forward peak and a negative peak, respectively, and the addition average is memorized as an offset value, or is added to a direct tracking error signal. In the case of the former, the value which also detected the track address, was made to correspond with an offset value, memorized, and had been memorized is read to next time of day, and offset is canceled by the same approach as the latter.
[0009] However, it may be set as the value which may detect the maximum and the minimum value of a tracking error signal which were mistaken when a defect etc. occurred on a disk, and mistook the offset value of a tracking error signal in case of this approach.
[0010] 4) In JP,4-23264,A, the method of gaining the best focus and determining the correction value of a focal error signal is indicated by repeating until the difference of two tracking error signals which can be acquired becomes sufficiently small about measuring the amplitude of a tracking error signal where forward and a negative increment are added to a focal error signal.
[0011] However, it is difficult also for this approach to cope with time fluctuation of offset of a focal error signal. Moreover, since it is completed by the difference of a tracking error signal, time amount is required.
[0012] It is common in the above-mentioned reference, and they are not indicating the approach of performing systematically proofreading of a tracking error signal, and proofreading of a focal error signal. Therefore, proofreading of these signals must be performed by separately different approach, and time amount is required so much.
[0013] moreover, the above -- it does not indicate using for proofreading of a tracking error signal or a focal error signal the tracking error signal which any reference generates by the track jump at the time of truck flattery.
[0014]
[Problem(s) to be Solved by the Invention] This invention aims at enabling it to repeat and proofread a tracking error signal and a focal error signal at the time of the usual actuation of an optical disk drive. When it states in detail, it is the offset and amplitude of a tracking error signal which are considered as the object of proofreading at the offset list of a focal error signal with semantics important for the engine performance and stability of servo system of an optical disk drive.
[0015] Other purposes of this invention are to shorten time amount after loading an optical disk until R/W of data is attained.
[0016] The purpose of further others of this invention is in making the parameter of its servo system follow in footsteps, even if it changes the condition of an optical disk drive with time amount.
[0017] Even if the purpose of further others of this invention has the demand of R/W of data, it is to answer without the time lag for proofreading.
[0018]

[Means for Solving the Problem] The optical disk drive of this invention A tracking actuator, A tracking error signal generation means, and offset and amplitude error of a tracking error signal are amended. A tracking servo means to generate the driving signal of the above-mentioned tracking actuator based on the tracking error signal after amendment, A focal actuator and a focal error signal generation means, A focus servo means to amend offset of a focal error signal and to generate the driving signal of the above-mentioned focal actuator based on the focal error signal after amendment, In at least 1 time of the track jump at the time of the means which emits a track jump command to the above-mentioned tracking servo means since a given truck is followed, and the above-mentioned given truck flattery In at least 1 time of the track jump at the time of a means to pass the value which applied the forward value to the offset value of the focal error signal for which it asked before to the above-mentioned focus servo means, and the above-mentioned given truck flattery In at least 1 time of the track jump at the time of a means to pass the value which applied the negative value to the offset value of the focal error signal for which it asked before the above to the above-mentioned focus servo means, and the above-mentioned given truck flattery The means passed to the above-mentioned focus servo means, without correcting the offset value of the focal error signal for which it asked before the above, A means to calculate the new value of offset of a focal error signal based on the amplitude of the tracking error signal generated by the track jump performed by correcting the focal error signal offset value at the time of the above-mentioned truck flattery, A means to calculate offset of a tracking error signal and the new value of an amplitude error based on the maximum and the minimum value of a tracking error signal which are generated by the track jump performed without correcting the focal error signal offset value at the time of the above-mentioned truck flattery is included.
[0019] Further, the optical disk drive of this invention memorizes the output of the above-mentioned count means for the memory location which becomes settled in the address of the above-mentioned given truck, and uses it at the time of the next proofreading.
[0020]
[Function] In this invention, an optical disk drive uses for truck flattery mode the track jump performed once per disk 1 rotation, and detects the error (offset, amplitude error) of a focal error signal and a tracking error signal by at least 3 times of track jumps. Furthermore, the effect of a noise is removed by combining with the value detected with the newly detected error near at hand.
[0021] Therefore, by this invention, a tracking error signal and a focal error signal can be conventionally repeated and proofread to activation of proofreading having been restricted at the time of a disk load at the time of normal operation, such as R/W of data. Moreover, it is not necessary to form proofreading mode specially at the time of a disk load, and time amount after loading an optical disk to an optical disk drive until it comes to be able to perform R/W of data can be shortened. Furthermore, even if it carries out the disk without load ****** for a long time, it becomes possible to make the parameter of servo system follow in footsteps of change of the condition of an optical disk drive.
[0022]
[Example] Drawing 1 is the block diagram of an example. Tracking servo control and focal servo control are performed using the servo processor 1 which consists of digital signal processors etc. A host processor 2 issues the command of a track jump, truck access, etc. to this processor 1. The focal error signal (FES) 3 and the tracking error signal (TES) 4 are inputted into the servo processor 1. FES and TES are generated by the means of common knowledge, such as a quadrisection detector and a two-piece-housing detector, respectively. After the servo processor 1 amends offset and amplitude error of TES in the offset list of FES and processes phase compensation etc. further, it outputs the focal actuator driving signal 5 and the tracking actuator driving signal 6.
[0023] The focal actuator driving signal 5 is inputted into a focal actuator, and the tracking actuator driving signal 6 is inputted into a tracking actuator. By a diagram, the focal actuator and the tracking actuator are collectively shown as a drive 7.
[0024] In this optical disk drive, unless a servo discharge command is taken out from a host processor 1, the focus servo and the tracking servo are turned ON. Moreover, since the truck of a disk is made spirally, when standing by on the same truck, 1 time per one disk revolution of a track jump is

performed. Also in the case of the track jump, both a focus servo and a tracking servo are ON. In the example, proofreading of a focal error signal and a tracking error signal is performed among 3 times of continuous track jumps.

[0025] Drawing 2 shows the maximum and the minimum value of a tracking error signal when changing and carrying out the track jump of the value of the offset canceled from a focal error signal. The time of the amplitude of a tracking error signal becoming max is in the Best Focas condition.

[0026] In order to measure the offset value at this time, in the example, the value which applied the forward value to the FES offset value before calculated at the time of truck flattery is passed to a servo processor, and a track jump is performed once. The value of the FES offset calculated before is read from the memory location which becomes settled in the address of the truck (it is hereafter called a current truck) which is carrying out current flattery. Next, the value which applied the negative value to the value of the offset calculated before is passed to a servo processor, and a track jump is performed once. Based on the amplitude of the tracking error signal generated by 2 times of this track jump, the FES offset value used for next focal servo control is calculated combining the offset value which calculated the offset value at the time of the Best Focas condition, and was calculated with this near at hand.

[0027] Finally the offset value calculated before is passed to a servo processor, without adding correction, a track jump is performed once, and the TES offset used for next tracking servo control and the value of an amplitude error are calculated from the maximum and the minimum value of the tracking error signal then generated.

[0028] Drawing 3 shows one example of the flow of processing of a servo processor. At step 30, it judges whether the track jump command was received from the host processor, and if it is a no, truck flattery actuation will be performed.

[0029] If it is yes, it progresses to step 31 and is FESoff (k) as a FES offset value. +a and FESoff (k) Any one value of -a or the FESoff (k) is received from a host processor. It is FESoff (k) by reception and the next jump about FESoff(k)+a at the time of three continuous jumps of the beginning of a track jump. FESoff (k) is received for -a in reception and the last jump. Therefore, the desired value of the focal error signal at the time of the 1st track jump is a value which added forward offset to original desired value (usually zero), and it is the value which added negative offset to original desired value at the time of the 2nd track jump. Original desired value is not corrected at the time of the 3rd track jump. Artificial offset a It is chosen as the magnitude which change of the amplitude of a tracking error signal can detect clearly. In addition, FESoff (k) is the FES offset value which was before calculated about the current truck and was memorized by memory. Initial value FESoff (0) is zero typically.

[0030] At step 32, FES is read from an A/D converter. Below, FESad [the read value] (k) is written. At step 33, the offset value received at step 21 is canceled from FESad (k). Below, FESloop [the value of FES after canceling] (k) is written. Next, after clearing the max of TESlpf, and the minimum value, the loop formation which consists of the following steps is entered.

[0031] First, TES is read from A/D. Below, TESad [the read value] (k) is written (step 35). Next, it lets TESad (k) pass to a low pass filter (step 36). Since TES becomes sine wave-like at the time of a track jump, the frequency is passed, and the cut off frequency of a low pass filter is set up so that the noise of a high frequency may be removed from it. TESlpf [the value of TES which passed the low pass filter] is written.

[0032] Next, a focal actuator driving signal is generated based on FESloop (k), and a focal actuator is supplied. Based on TESad (k), a tracking actuator driving signal is generated to coincidence, and it is supplied at a tracking actuator (step 37).

[0033] Step 37 compares with the maximum to current TESlpf obtained at step 36. If former one is large, maximum will be updated to the former value, otherwise, nothing will be done. Furthermore, the comparison of the minimum value by TESlpf and the present is also performed. If former one is small, the minimum value will be updated to the former value, otherwise, nothing will be done.

[0034] It continues (step 39) turning around a loop formation until a jump is completed. It has a time of the sine wave (TES) for one period occurring, and judges with termination of a jump.

[0035] After escaping from a loop formation, it progresses to step 40 and the max of TESlpf and the minimum value are sent to a host processor (step 40). The rest performs the usual truck flattery actuation.
[0036] Drawing 4 shows one example of the flow of processing of a host processor. First, it judges whether truck flattery mode has a drive (step 41). If it is in truck flattery mode, it will progress to step 42. At the times other than truck flattery mode, at the time of loading of a disk and an unload etc. clears the sequence in detection mode.
[0037] If it is not the timing of a track jump at step 42, the current track address will be read from the signal which reproduced the pre pit of an optical disk. If it is the timing of a track jump, it will progress to step 43 and the FES offset value written in before will be read from the memory location corresponding to a current track address. After an appropriate time, according to delivery and detection mode, delivery, the max of TES, and detection of the minimum value are requested [a track jump command] from a servo processor for a FES offset value (steps 44 and 45). The max of detected TESlpf and the minimum value are sent to a host processor from a servo processor (step 46). "Processings corresponding to detection mode" of step 47 is the following three processings by the host processor.
[0038] First, one example of the flow of processing in the detection mode 0 is shown in drawing 5 . At step 51, from the max of TESlpf detected by the 1st track jump, and the minimum value, amplitude error TESamp+ of TES is calculated and it writes in memory. The amplitude error formula of TES common to step 51 and steps 61 and 71 mentioned later is as follows.
TESamp= (TESlpf, max-TESlpf, min)/TES0 -- here, TES0 is the target amplitude value of TES.
[0039] At step 52, detection mode is set to 1 and processing in the detection mode 0 is ended.
[0040] One example of the flow of processing in the detection mode 1 is shown in drawing 6 . At step 61, amplitude error TESamp- of TES is calculated from the max of TESlpf detected by the 2nd track jump, and the minimum value. At step 62, TESamp+ calculated at the time of the detection mode 0 is read from memory.
[0041] At step 63, the estimate FESnew of the offset which makes the amplitude of TES max, that is, gives the Best Focas condition is calculated according to the formula (1) first shown in drawing. Next, according to the formula (2) shown in drawing 2 , the optimal new offset value FES (k+1) for using for next focal servo control is computed by combining FESoff (k) and FESnew. Later describes a coefficient C.
[0042] FESoff (k+1) is written in the memory location corresponding to a current track address at step 64, detection mode is set to 2 at step 65, and processing in the detection mode 1 is ended.
[0043] One example of the flow of processing in the detection mode 2 is shown in drawing 7 . At step 71, the amplitude error TESamp of TES and Offset TESoff are calculated from the max of TESlpf, and the minimum value. Here, TESoff is calculated according to the following formula.
TESoff=TESlpf, max+TESlpf, min [0044] At step 72, the amplitude error TESamp of TES (k) and Offset TESoff (k) are read from the memory location corresponding to a current track address. Those initial value TESamp (0) and TESoff (0) is zero typically. At step 73, the optimal new amplitude error value TESamp for using for next tracking servo control (k+1) and the offset value TESoff (k+1) are calculated according to the formula (3) shown in drawing, respectively, and (4).
[0045] A count result is written in the memory location corresponding to a current track address, detection mode is set to 0, and processing in the detection mode 2 is ended.
[0046] Since the coefficient C used for updating count of an offset value and an amplitude error value becomes [or more 0] easy to be influenced of incorrect detection according to the defect of a disk etc. conversely although it is one or less, and it becomes a rapid response so that it is close to 0, it is chosen according to the actual amplitude or the fluctuation velocity of offset.
[0047] TESamp (k), TESoff (k), and FESoff (k) do not need to change a location for every truck, and do not need to memorize it in memory. The representation data of the truck with which some approached may be memorized for the memory location which becomes settled in the high order bit of the address of those trucks.
[0048] The amplitude error value TESamp (k+1) and the offset values TESoff (k+1) and FESoff (k+1)

which are acquired as mentioned above are always used for tracking servo control or focal servo control until proofreading is performed next. That is, the focal error signal which uses for focal servo control the tracking error signal used for tracking servo control according to a formula (5) is corrected according to a formula (6).

TESloop = (TESad - TESoff(k+1)) * TESamp(k+1) (5)

FESloop = FESad - FESoff(k+1) (6)

[0049] As mentioned above, although the specific example was explained, the applicability of this invention is not necessarily restricted to this. For example, it is FESoff (k) about a FES offset value. +a and FESoff (k) - The track jump performed as a or FESoff (k) is made into 2 times or more, respectively, and you may make it raise the accuracy of measurement of FESoff (k+1), TESoff (k+1), and TESamp (k+1). But since the wave of the tracking error signal generated by the track jump at the time of truck flattery is stable unlike the time of seek operation, in many cases, FESoff (k+1), TESoff (k+1), and TESamp (k+1) can be calculated with a sufficient precision by 1 time of the track jump, respectively.

[0050] Or it is FESoff (k) about the sequence of the FES offset value passed to a servo processor. +2a and FESoff (k) +a and FESoff (k) -a and FESoff (k) It is good also as -2a and FESoff (k). In that case, a FES offset value is FESoff (k). +2a and FESoff (k) - The value of the formula (1) for which it asked from the amplitude of TES at the time of being 2a, A FES offset value is FESoff (k). +a and FESoff (k) - The precision of the estimate of FES offset can be raised by averaging the value of the formula (1) for which it asked from the amplitude of FES at the time of being a, and calculating FESnew.

[0051] Drawing 8 shows other examples of the flow of processing of a servo processor. Steps 80, 81, and 82 are added as compared with drawing 3 . In this example, TES is not read until it becomes T=N (i.e., until predetermined time amount passes). In the meantime, a tracking actuator is not driven. Thus, the response of a focal error signal is brought forward and it can avoid being late for a track jump by driving a focal actuator previously.

[0052] It is possible to make the actuation to which the optical disk drive to which the disk with which the slot is not built spirally is loaded is also jumped on the next truck at the time of truck flattery, is further jumped on the original truck, and returns for proofreading repeat. Also in such a case, since a tracking error signal occurs, this invention is applicable.

[0053]

[Effect of the Invention] According to this invention, it becomes possible to repeat and proofread a tracking error signal and a focal error signal at the time of the usual actuation of an optical disk drive. Moreover, time amount after loading an optical disk until R/W becomes possible can be shortened. Furthermore, even if it changes the condition of an optical disk drive with time amount, the parameter of servo system can be made to follow in footsteps of it. Moreover, even if there is a demand of R/W of data, it can answer without the time lag for proofreading.

[Translation done.]

* NOTICES *

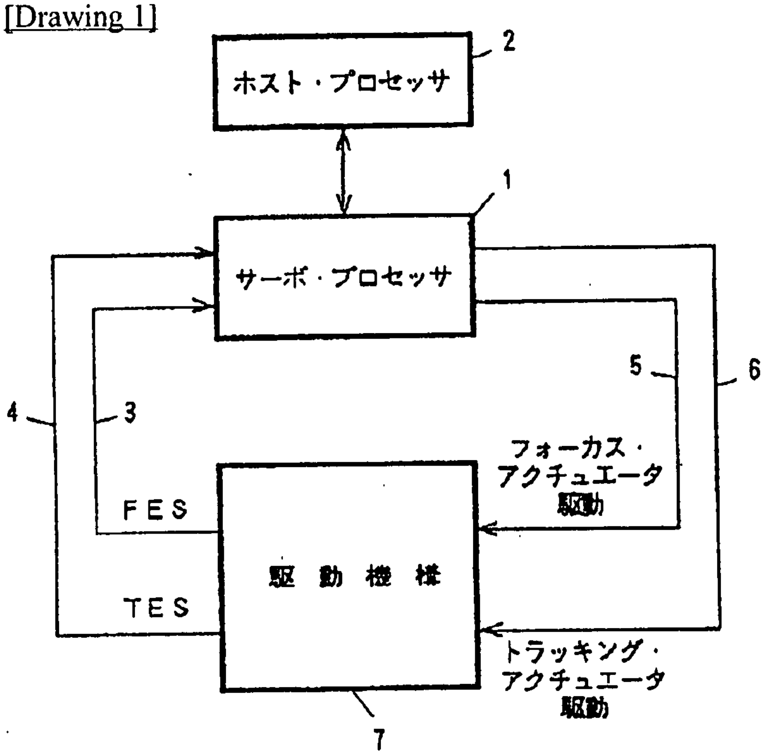
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the optical disk drive of an example.
[Drawing 2] It is the graph which shows the relation of the maximum of FES offset and TES, and the minimum value.
[Drawing 3] It is the flow chart which shows an example of processing of a servo processor.
[Drawing 4] It is the flow chart which shows an example of processing of a host processor.
[Drawing 5] It is the flow chart which shows processing in the detection mode 0.
[Drawing 6] It is the flow chart which shows processing in the detection mode 1.
[Drawing 7] It is the flow chart which shows processing in the detection mode 2.
[Drawing 8] It is the flow chart which shows other examples of processing of a servo processor.

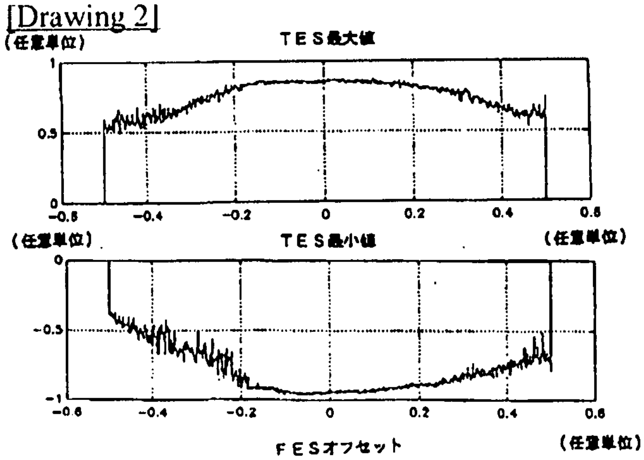
[Translation done.]

DRAWINGS

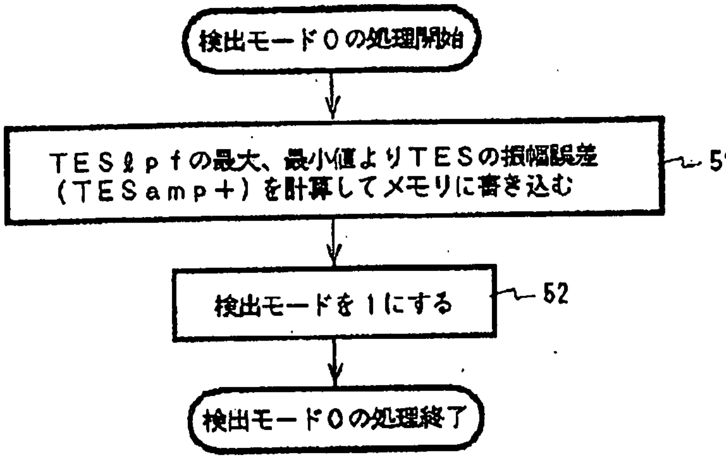
[Drawing 1]



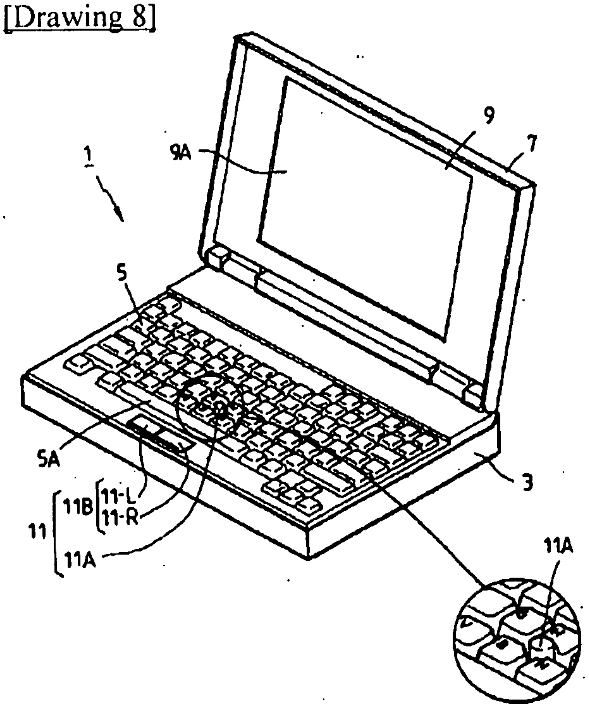
[Drawing 2]



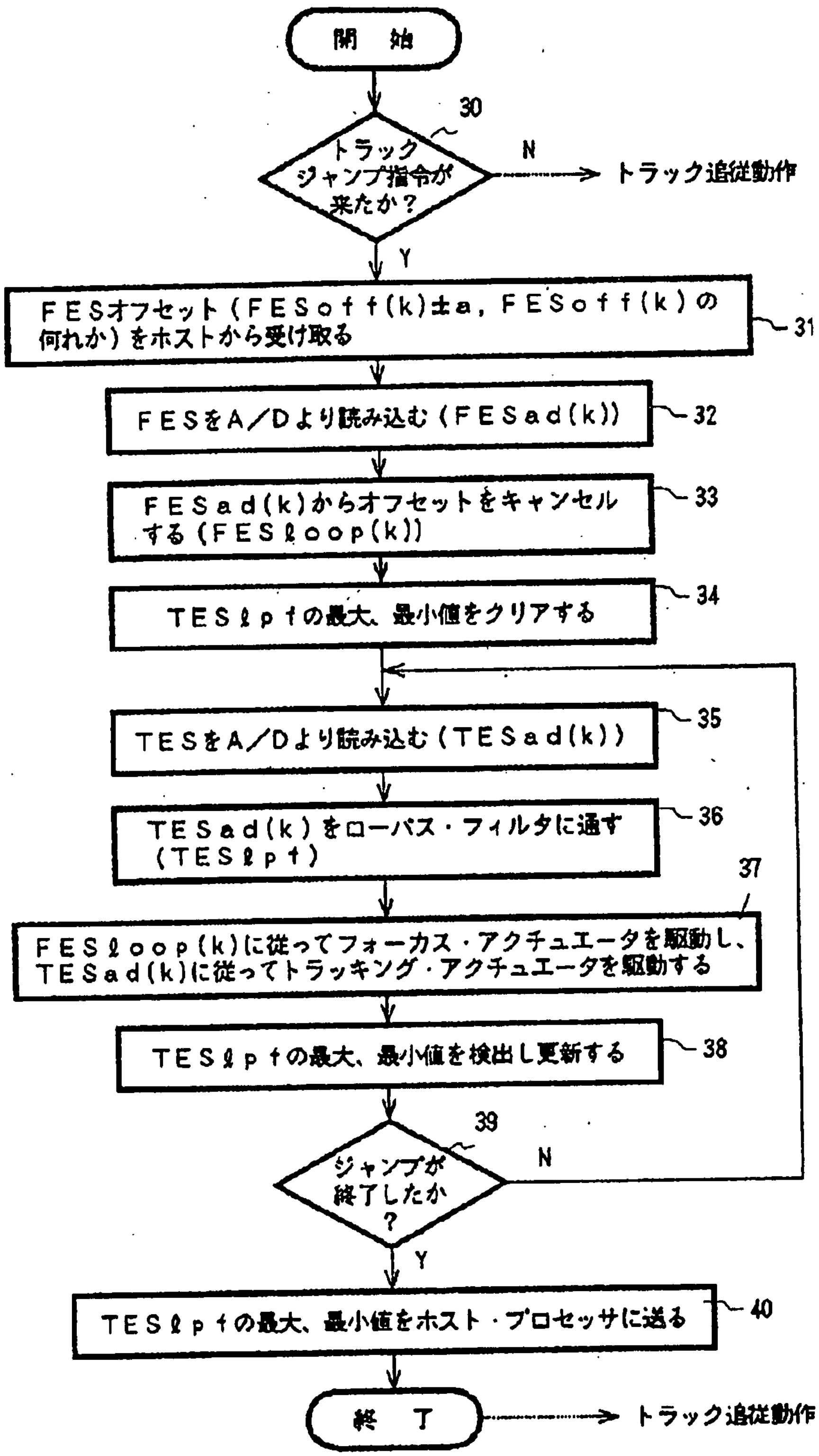
[Drawing 5]



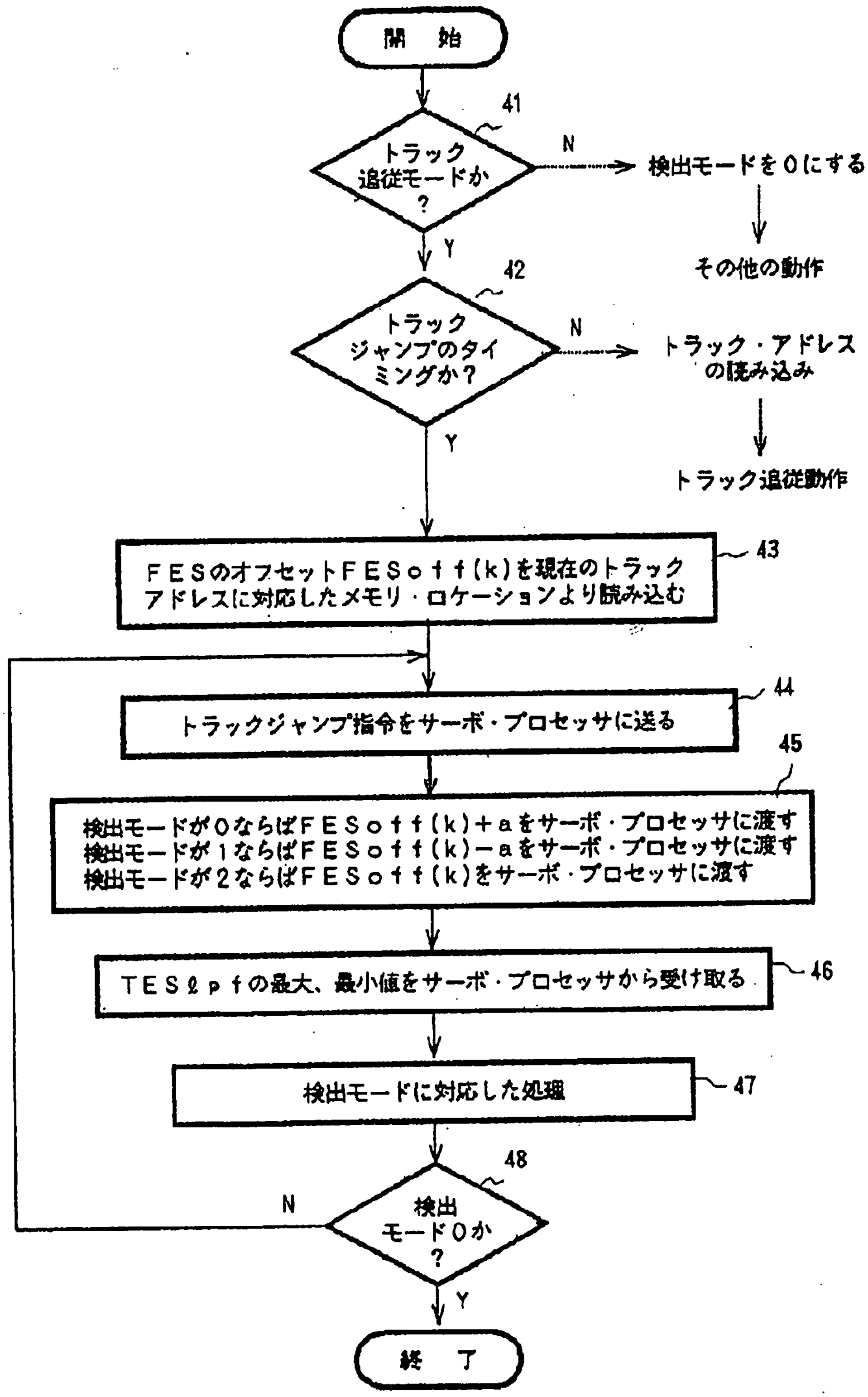
[Drawing 8]



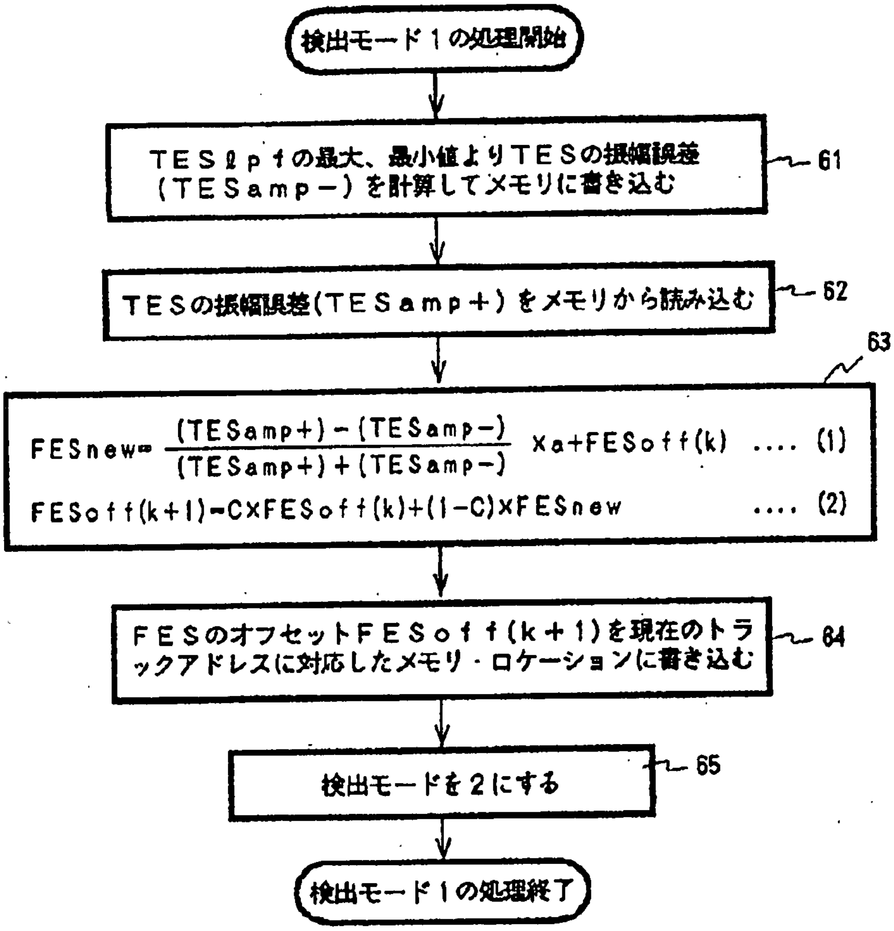
[Drawing 3]


開 始
30
トラック
ジャンプ指令が
来たか？
N
トラック追従動作
Y
FESオフセット（FESoff(k)±a, FESoff(k)の何れか）をホストから受け取る
31
FESをA/Dより読み込む（FESad(k)）
32
FESad(k)からオフセットをキャンセルする（FESℓoop(k)）
33
TESℓpfの最大、最小値をクリアする
34
TESをA/Dより読み込む（TESad(k)）
35
TESad(k)をローパス・フィルタに通す（TESℓpf）
36
37
FESℓoop(k)に従ってフォーカス・アクチュエータを駆動し、TESad(k)に従ってトラッキング・アクチュエータを駆動する
TESℓpfの最大、最小値を検出し更新する
38
39
ジャンプが
終了したか
？
N
Y
TESℓpfの最大、最小値をホスト・プロセッサに送る
40
終 了
トラック追従動作

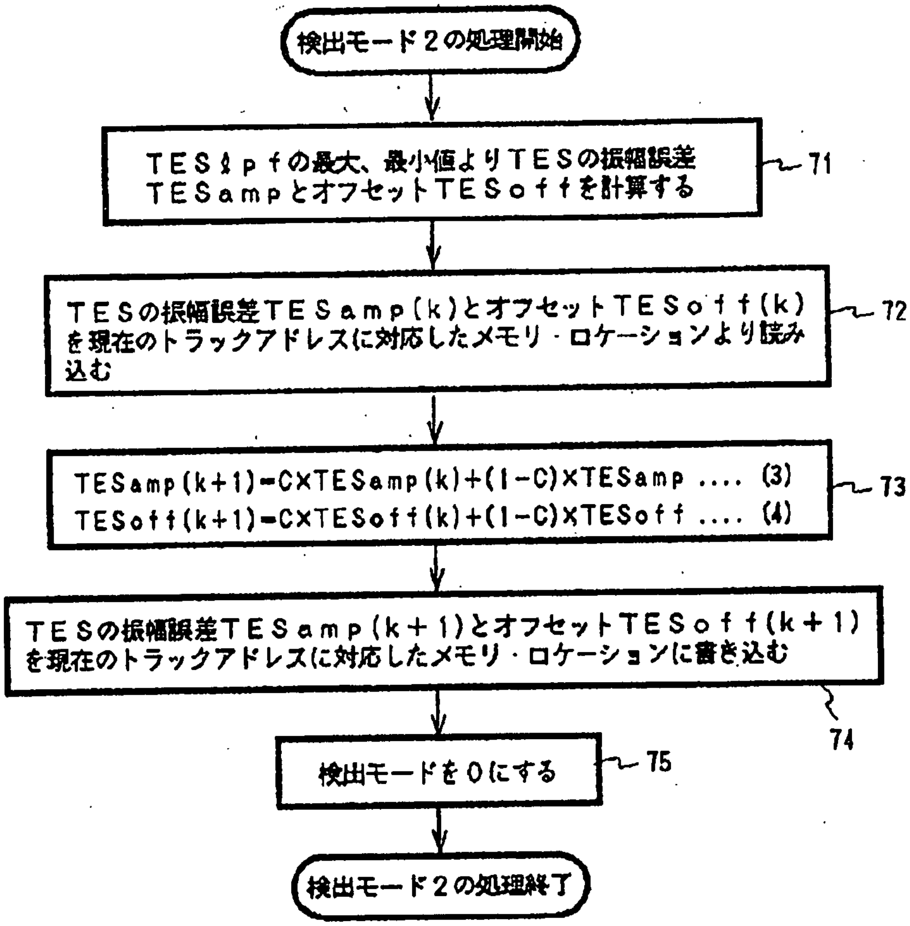
[Drawing 4]


開　始
41
トラック
追従モードか
?
N
検出モードを０にする
その他の動作
Y
42
トラック
ジャンプのタイ
ミングか？
N
トラック・アドレス
の読み込み
トラック追従動作
Y
ＦＥＳのオフセットＦＥＳｏｆｆ(ｋ)を現在のトラック
アドレスに対応したメモリ・ロケーションより読み込む
43
トラックジャンプ指令をサーボ・プロセッサに送る
44
45
検出モードが０ならばＦＥＳｏｆｆ(ｋ)＋ａをサーボ・プロセッサに渡す
検出モードが１ならばＦＥＳｏｆｆ(ｋ)－ａをサーボ・プロセッサに渡す
検出モードが２ならばＦＥＳｏｆｆ(ｋ)をサーボ・プロセッサに渡す
ＴＥＳｌｐｆの最大、最小値をサーボ・プロセッサから受け取る
46
検出モードに対応した処理
47
48
N
検出
モード０か
?
Y
終　了

[Drawing 6]


検出モード１の処理開始
ＴＥＳｌｐｆの最大、最小値よりＴＥＳの振幅誤差（ＴＥＳａｍｐ－）を計算してメモリに書き込む
61
ＴＥＳの振幅誤差（ＴＥＳａｍｐ＋）をメモリから読み込む
62
63
FESnew= (TESamp+) − (TESamp−) / (TESamp+) + (TESamp−) Xa+FESoff(k) .... (1)
FESoff(k+1)=CXFESoff(k)+(1−C)XFESnew .... (2)
ＦＥＳのオフセットＦＥＳｏｆｆ（ｋ＋１）を現在のトラックアドレスに対応したメモリ・ロケーションに書き込む
64
検出モードを２にする
65
検出モード１の処理終了

[Drawing 7]



[Translation done.]